

Supersonic Firebee II Data Sheet



Supersonic Firebee II

Introduction

The Ryan supersonic Firebee II, XBQM-34E, is in final design and initial fabrication stages for the Naval Air Systems Command. The contract requires fabrication of four prototype, one static test and ten pre-production test and evaluation aircraft.

Laboratory and ground testing related to structural design, engine and electronic installations, as well as fabrication will progress through 1966. A flight test program is scheduled to begin by mid-1967 at Point Mugu, Calif.



Supersonic Firebee design incorporates capability for future growth

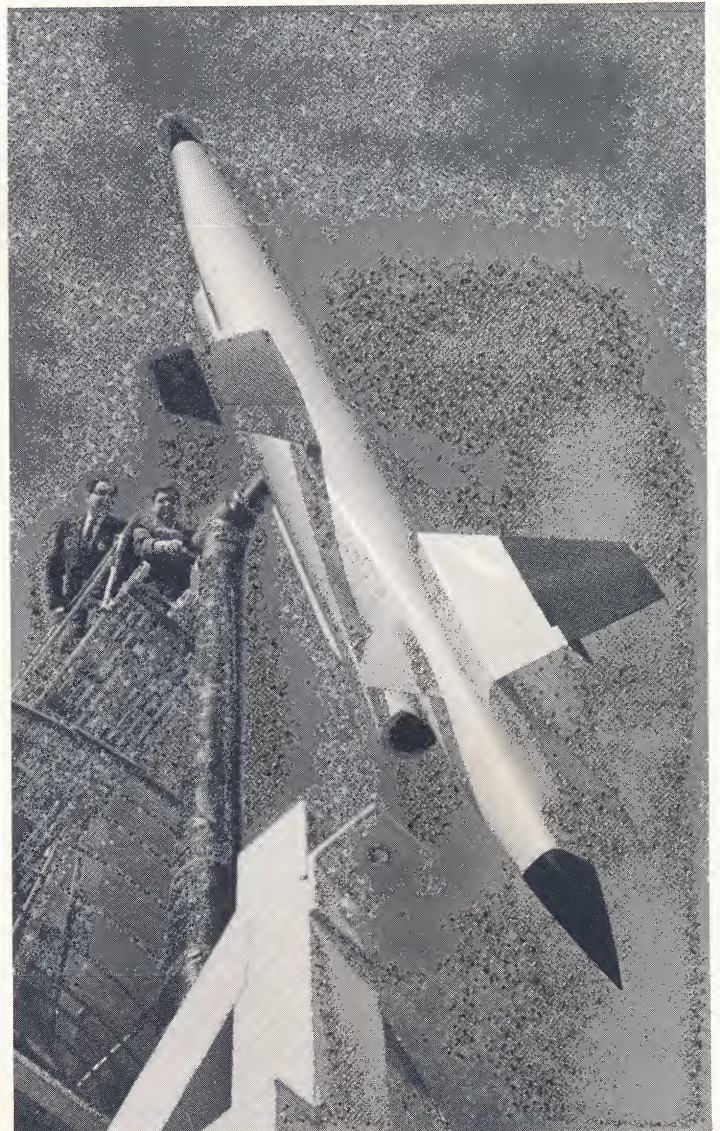
The new generation Firebee will perform missions in excess of 60,000 feet, achieving speeds exceeding Mach 1.5 and will have 5g maneuverability capabilities.

The Continental YJ69-T-6 turbojet engine, a modification of the same power plant used in the present BQM-34A Firebee, will develop 1840 lb. of static sea level thrust to power the supersonic XBQM-34E.

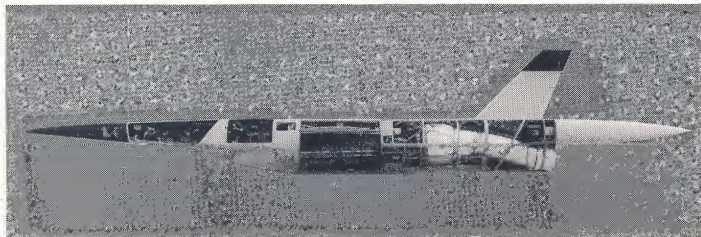
Slightly longer, slimmer, and with shorter wings than the BQM-34A, the new Firebee will use flush antennas to preserve its supersonic configuration.

The Navy's new flying target is designed to carry an external fuel pod under its fuselage. After completion of a subsonic mission, the pod is jettisoned for higher performance, supersonic flight.

In keeping with Ryan economy practices, the new design calls for use of many of the components of the BQM-34A Firebee.



Engineers check full scale supersonic model during antenna tests



Slim profile houses compact higher thrust engine in supersonic Firebee



Jettisoning of fuel pod makes Firebee supersonic

Augmentation

The XBQM-34E Firebee will carry active and passive augmentation as currently employed in the present subsonic Firebee.

Performance

Mach 1.1 @ sea level
Mach 1.8 @ 50,000 feet
Mach 1.5 in excess of 60,000 feet

Maneuverability

5g's capability at altitudes up to 20,000 feet

Payload Capability

Supersonic configuration (clean)

Empty weight1257.0 lb.

Useful load —

Augmentation equipment 160.0 lb.

Internal fuel & oil 278.0 lb.

Gross Weight1696.0 lb.

Subsonic Configuration (Fuel pod on)

Empty Weight—including pod1287.0 lb.

Useful load —

Augmentation equipment 160.8 lb.

Internal & External fuel & oil 678.2 lb.

Gross Weight2126.0 lb.

Design structural gross weight: 2300 lb. for future growth.

Typical Missions

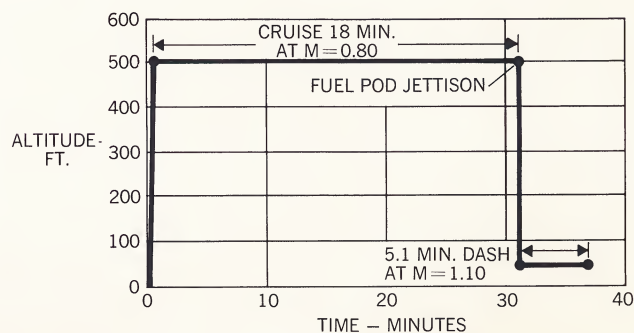
Combined Subsonic Cruise/Supersonic Dash—With the external fuel pod attached, the XBQM-34E Firebee climbs, levels at 50,000 feet, and cruises for 30 minutes at Mach .9; then dropping the external fuel pod, it climbs while accelerating through Mach 1.5 and provides 20 minutes at 60,000 feet at Mach 1.5. Total mission time: 1 hr. 15 min.

Low Altitude Cruise/Supersonic Dash Mission—with the external fuel pod on, the XBQM-34E can be leveled at 500 feet at Mach .8 for 18 minutes; whereupon the pod is jettisoned and using the automatic low altitude system, descends and levels at 50 feet. This provides a supersonic dash at Mach 1.1 for 5 minutes. Total mission time: 23 minutes.

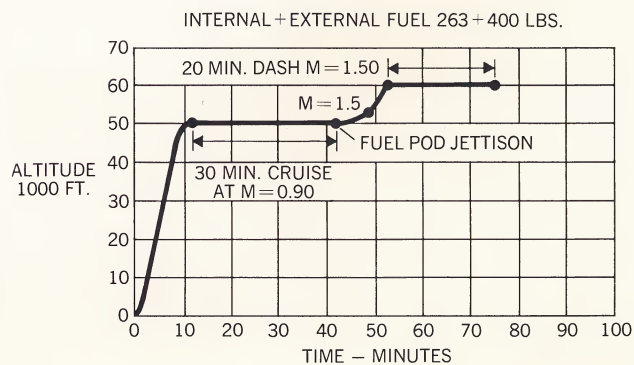
Growth Potential

The supersonic Firebee airframe, flight control system and subsystem are being designed and built to incorporate the proposed Continental growth engine. With 2,980 lb. static sea level thrust, the growth version of the XBQM-34E will be capable of operation at Mach 1.4 @ sea level, Mach. 2.4 @ 50,000 feet, and Mach. 2.0 @ 70,000 feet.

Low Altitude Cruise/Supersonic Dash Mission Profile



Combined Subsonic Cruise/Supersonic Dash Mission Profile



The first Firebee jet target system began to take shape on Ryan Aeronautical Company engineering boards nearly 18 years ago. It was 1947 when Ryan received the initial contract to develop and produce the first jet-powered airborne target system. Since, through continued refinement of the basic system, several generations of Firebees have made Ryan the acknowledged leader in providing the military services with realistic airborne target systems. Firebees evaluate weapons systems and continue as a high performance vehicle in personnel training for air defense weapons systems.

Simulating enemy aircraft, the remotely controlled, pilotless Firebees also serve as tools for evaluating the effectiveness of new missiles as they progress through developmental and operational testing.

Since 1947, Ryan has developed a complete family of Firebee aerial targets to satisfy increasing service requirements. Over 2500 Firebees have been delivered to all three branches of the military and more than 10,000 operational Firebee missions have been flown at U.S. and off-shore bases from Puerto Rico to the Philippines. Firebees have also been delivered to the Royal Canadian Air Force, and have been flown in support of Arctic cold weather missile evaluation exercises.

The evaluation of the Firebee has satisfied the increasingly sophisticated demands of the air defense weapons systems. Present production versions of the Firebee (Air Force and Navy BQM-34A) and (Army MQM-34D) along with the current Navy development of the supersonic Firebee, the XBQM-34E, represent not only an airborne jet target, but a complete system for evaluation of all air-to-air or ground-to-air defense systems.

Ryan Firebees can extend these air defense weapons systems to evaluate performance at the design limits of their capabilities, as well as simulate the enemy airborne threat in all performance parameters, physical size and tactics, including countermeasures.

The Firebee can also perform the vital personnel training function for these weapon systems to the fullest degree of cost effectiveness.

By integrating proven subsystems, the air or ground launched Firebee can also offer a series of formidable, yet economical offensive or defensive weapons systems delivering up to a 1000-pound payload.

Nearly 18 years of uninterrupted target-drone experience has developed within Ryan the largest pool of management, technical, manufacturing and field service talent available in the field today. The Ryan Firebee management organization incorporates the necessary technical disciplines and other specialized personnel resources to successfully accomplish the aerial target-drone requirements for any air defense system, including systems management, design, development, flight testing, tooling, manufacturing and flight services.

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NIMBUS WEATHER SATELLITES

NIMBUS II SETS LONG LIFE IN SPACE RECORD FOR COMPLEX EARTH-ORBITING SATELLITE SYSTEMS



NIMBUS II, the National Aeronautics and Space Administration's advanced meteorological satellite (metsat) was launched into earth-orbit May 15, 1966. The nation's most sophisticated weather satellite, NIMBUS II took more than 280,000 day and night photos of the earth in its first three months of operation. NASA's NIMBUS I took 27,000 such photos in its 28-day lifetime. NIMBUS II carries the same cameras as its predecessor, plus a Medium Resolution Infrared Radiometer and a Direct Readout system that permits transmission of nighttime photos through the Automatic Picture Transmission System. NIMBUS III will carry still additional experiments expected to have far-reaching implications on meteorology. The General Electric Company's Missile and Space Division is the major industrial contractor for the spacecraft; and developed and built the control and stabilization system for NASA's Goddard Space Flight Center.

NIMBUS II

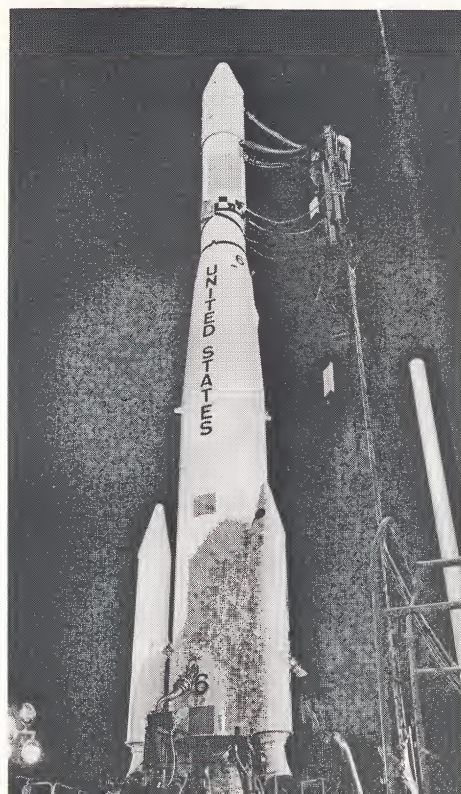
DESCRIPTION: Windmill shaped, 10-foot-tall and 11-foot-wide. Weight is 912 lbs. Base houses all meteorological observation sensors plus associated electronics. Upper structure houses the satellite attitude control system. Two 8-foot-tall by 3-foot-wide solar paddles protrude from both sides of the control section.

POWER: Eight nickel-cadmium batteries, connected in parallel, are powered by 10,500 solar cells. Maximum power output is about 500 watts.

CONTROL SYSTEM: Earth-oriented and stabilized in all three axes. Orientation is performed by horizon scanners and a system of flywheels and gas jets.

CAMERA SYSTEMS: Three Advanced Vidicon Camera Systems (AVCS) which produce a picture with one-half mile resolution. One Automatic Picture Transmission

NIMBUS II atop the Thrust-Augmented-Thor Agena B launch vehicle at the Western Test Range, Vandenberg AFB, California.

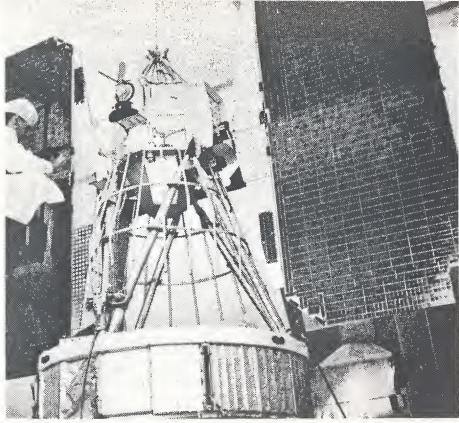


System (APTS) which sends instant photos to more than 150 ground stations located in 26 countries around the world.

APTS uses the slow scan television technique with a resolution of about two miles. One High Resolution Infrared Radiometer (HRIR) System which produces nighttime photos by measuring differences in heat between land, water and clouds. HRIR resolution is five miles. One Medium Resolution Infrared Radiometer (MRIR) System which measures the Earth's heat balance—how much of the Sun's radiation the world absorbs daily and how much is reflected back into the atmosphere. The MRIR measures water vapor absorption, atmospheric window, stratospheric temperatures, terrestrial radiation and albedo radiation. MRIR resolution is about 30 miles.

Polar orbit and the Earth's rotation enables the NIMBUS II camera systems to transmit approximately 3,000 photos daily. NIMBUS covers the entire world in thirteen orbits, or once daily.

GROUND SYSTEMS: NIMBUS ground operations are divided into five general areas: Data Acquisition Facilities (DAF), at Fairbanks, Alaska and Rosman, North Carolina; NIMBUS Technical Control Center at Goddard, which is the nerve center for all NIMBUS operations; NIMBUS Data Handling System at Goddard, which receives spacecraft performance data and pictures from the two DAFs; NIMBUS Data Utilization Center at Goddard, which processes and distributes all meteorological data and pictures; and the APT ground equipment that is required for day and night picture reception.



GE technicians test NIMBUS II before shipment to Western Test Range.

NIMBUS I

LAUNCH VEHICLE: Thor Agena B

LAUNCH SITE: Western Test Range,
Vandenberg AFB,
California

LAUNCH DATE: August 28, 1964
00:57 PDT

ORBIT:
Apogee: 578 miles
Perigee: 262 miles
Period: 99 minutes
Inclination: 81 deg. retrograde

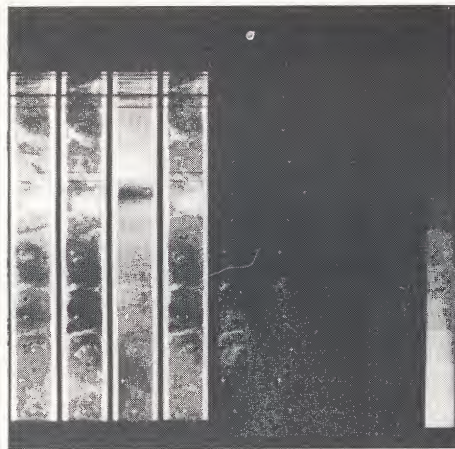
NIMBUS II

Thrust-Augmented-Thor Agena B

Western Test Range,
Vandenberg AFB, California

May 15, 1966
00:56 PDT

725 miles (planned: 690 miles)
680 miles (planned: 690 miles)
108 minutes (planned: 107 min.)
79.9 deg. retro. (planned: 80.0 deg.
retro.)



NIMBUS II MRIR photo.

FLIGHT RESULTS

During its first day in orbit, NIMBUS II photographed Typhoon Irma in the Philippine Islands. Since then it has located and tracked Hurricanes Alma, Dora and Faith as well as numerous other storms throughout the world.

NIMBUS II became the first satellite to measure the Earth's albedo. Physicists hope this heat balance study may unlock some of the mystery of weather storm development and dissipation. The five different eyes of the MRIR in the photograph left looked at a swath of the world 2,000 miles wide and more than 11,000 miles long. Each of the five strips contains different meteorological data, yet all cover the same area. The film strip was taken during a 100 minute period from an altitude of 700 miles. The film sequence started at 30 deg. North Latitude, continued to the South Pole, back up to the North Pole and ended at 60 deg. North Latitude.

The 6.4 to 6.9 microns strip is the water vapor absorption band and provides information on atmospheric structure and water vapor distribution. Scientists can measure which affects water vapor content; the higher the temperature, the higher the water vapor.

The 10.0 to 11.0 microns strip measures the Earth where the atmosphere is transparent.

The 14.0 to 16.0 microns strip records temperature in the stratosphere from 35,000 to more than 100,000 feet by measuring the emission from the carbon dioxide absorption band.

The 5.0 to 30.0 microns strip contains terrestrial radiation data and permits a study of the energy budget of the Earth's total longwave infrared emission.

The 0.2 to 4.0 microns strip contains solar radiation data in the visible and near infrared range to determine the amount of solar energy reflected by the Earth and its atmosphere.

NIMBUS II's cameras tracked Hurricane Alma from its birth to death and spotted Hurricane Faith as it first boiled up as a tropical storm off the west coast of Africa.

NASA's NIMBUS II has, in its record-breaking journey around the world, transmitted data that will serve to form the mathematical models for future weather forecasting.

NIMBUS II has long broken the record for long life in space of Earth-orbiting complex spacecraft.

NASA officials have hailed the GE-designed and built stabilization and control system as "one of the most significant engineering achievements of the NIMBUS II is the flawless operation of the control system which has kept the satellite stable and pointing directly at the Earth to within $\pm$ one degree."

Based on the principle that the Earth is warm and space is cold, infrared sensors continually scan the Earth's horizon. Position information from the sensors is automatically fed into the computer on board the satellite. Should the computer find the horizon "off center," it immediately commands electrically-driven flywheels and gas jets to reposition the satellite in its proper attitude.



Montage of 14 APTS photographs, taken from 700 miles high by NIMBUS II weather satellite.

NIMBUS I

NIMBUS I photographed Hurricane Cleo during its first day in orbit and subsequently took exceptionally clear photos of Hurricane Dora and Typhoon Ruby. On the basis of photos taken by NIMBUS I, Mount Siple, a 10,000-foot-high mountain in Antarctica used by pilots as a navigational aid, was repositioned 45 miles further west on relief maps. NIMBUS I photos also indicated that a mountain group thought to be in the Kohler Range doesn't really exist. In addition, NIMBUS I pictures provided engineers with a much better definition of the formation of the Antarctic ice front in the Filshner Ice Shelf, Weddell Sea and Princess Martha Coast areas.

Effect of Hurricane Alma on weather over the Eastern seaboard of U.S. as seen from NIMBUS II, June 10, 1966.





The Nile Delta as viewed by NIMBUS II at 700 miles.

NIMBUS B

Nimbus B will become the first meteorological satellite to use a Space Nuclear Auxiliary Power (SNAP) system. The SNAP 19 Radioisotope Thermoelectric Generator (RTG) system will augment primary solar battery power supply. Although the inclusion of the SNAP 19 system will be primarily for experimental purposes, it will provide about 50 watts of regulated and usable power.

The SNAP 19 system will be incorporated into the sensory ring of the satellite and will not add to the over-all dimensions of the spacecraft. It consists of two radioisotope-fueled thermoelectric generators, a dc-dc conversion system to step up the RTG power to usable satellite voltage, telemetry equipment to transmit data required to assess the

condition and performance of the RTG's, electrical circuitry, support and mounting structure and an emergency ejection system.

In addition to the SNAP 19 RTG system, the NIMBUS B spacecraft will contain experiments designed to collect data in the visible, ultra-violet and infra-red spectra. HRIR and MRIR systems again will be flown on NIMBUS B. A series of spectrometer experiments also will be added to measure such phenomena as the Earth's spectral radiance, atmospheric temperature structure, and solar radiation in several spectral regions to detect time variations in the relative intensity of the near ultra-violet radiation from the sun.

One new experiment that is expected to have far-reaching implications in meteorology and geodetics is the Interrogation, Recording, and Location System (IRLS). This system will regularly receive ground meteorological data from land or sea-based monitoring stations, and relay it to special data centers. Such a system might be used to report meteorological conditions from otherwise inaccessible regions, and also could be valuable as a navigation aid.

NIMBUS B will replace the previous Automatic Picture Transmission System with a continuous Motion Camera System providing continuous daylight pictures of the Earth's cloud cover. Like the HRIR and MRIR, the new system also will have a real time picture readout characteristic.

Montage of 15 AVCS photographs shows the Mediterranean Sea region.



Artist's conception of an advanced NIMBUS weather satellite with two SNAP systems stacked on spacecraft's forward rim.

GENERAL  ELECTRIC
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